Introduction

Benton Lake is a 12,383 acre refuge located on the western edge of the northern Great Plains some 50 miles east of the Rocky Mountains and 12 miles north of Great Falls, Montana. Benton Lake proper is a 5,000 acre glacial lake bed which is the terminus, or sump, of a 150 square mile watershed. Refuge terrain is gently rolling with mixed grass native prairie the predominant vegetation.

The climate is generally temperate, but wild fluctuations may occur. Summer highs may soar to over 100 degrees Farenheit, while winter lows may plunge to near 50 degrees below zero. Rain and snow are erratic with the area averaging only 12 inches of precipitation a year. Evaporation losses average 42 inches per year. Extremely windy conditions often occur fall through spring due to Chinook winds that develop along the Rocky Mountain Front.

The refuge was established by Executive Order in 1929 as "a refuge and breeding ground for birds". Little development of the refuge occurred until the station was staffed in 1961. At about this same time, a pumping station was built on Muddy Creek 15 miles to the west to bring return irrigation flows to the refuge via a pipeline and Lake Creek. This additional water source has eliminated the boom and bust cycle of the refuge marsh, generally assuring some water even in times of severe drought. The refuge is one of the premiere waterfowl production refuges in the country, producing to flight stage as many as 20,000 ducks in a year.

The lake or marsh has been divided into eight marsh units to more efficiently use available water and allow for water manipulation (Figure 1). Water management between units is generally by gravity flow, although an inter-unit pump system is available for moving water between lower marsh units.

Refuge wildlife is dominated by waterbirds, including most major species of ducks, Canada geese, gulls, terns and various shorebirds. Peak one-time migration numbers include 100,000 ducks, 40,000 snow and dark geese, 5,000 tundra swans and upwards of 10,000 shorebirds. There are no threatened or endangered species that regularly use the refuge, although an occasional bald eagle is sighted on the refuge during spring and fall. Other refuge wildlife includes 20 species of prairie mammals, but only a handful of reptiles and amphibians. No sizeable fish are present due to the shallowness of the marsh.

Overview of Refuge Management

Water is a key focus of management activities on Benton Lake NWR. The long-term average for natural run-off into Benton Lake is 3,550 acre-ft. Most of the natural run-off comes from precipitation in the spring. In addition to natural run-off, water is pumped from Muddy Creek onto the refuge. The long-term average for this supplemental water is another 4,250 acre-ft. Water is usually pumped twice a year, typically from mid-May

to mid-June and again in the fall from mid-August through September. The exact timing and amount of water pumped varies considerably from year to year, depending on natural precipitation and funding.

Since water management between units is primarily through gravity flow, units I and II (see Figure 1) must be filled with water before any of the lower units can be filled. This essentially means that units I and II are never dried out. In addition, there is no outlet to Benton Lake, so drying of the lower units occurs primarily through evaporation. Occasionally, burning and/or discing of wetlands may occur to rejuvenate the vegetation.

The majority of uplands on Benton Lake are native prairie grasslands. Fire is the primary management tool for uplands. The refuge is currently in a rotation to burn 1,000-2,000 acres annually. Prescribed burns can occur in the spring or fall. There is some Dense Nesting Cover on the refuge that may be hayed or burned to rejuvenate the vegetation. Major infestations of non-native species have not been a problem on the refuge, and thus, eradication or control efforts have been minor.

Landscape context for Benton Lake Complex

Benton Lake Complex includes the refuge and a 10-county wetland management district in north-central Montana. The refuge and the district sit at the edge of the Pacific Flyway to the west and the Central Flyway to the east. The refuge is an important area for breeding and migrating waterfowl and other birds. The refuge has been designated an Important Bird Area and a Western Hemisphere Shorebird Reserve Network site. Most of the land use around the refuge has been converted to small grain production, primarily wheat. The area from Great Falls north to the Canadian border is known as the "Golden Triangle" of Montana due to the sea of grain.

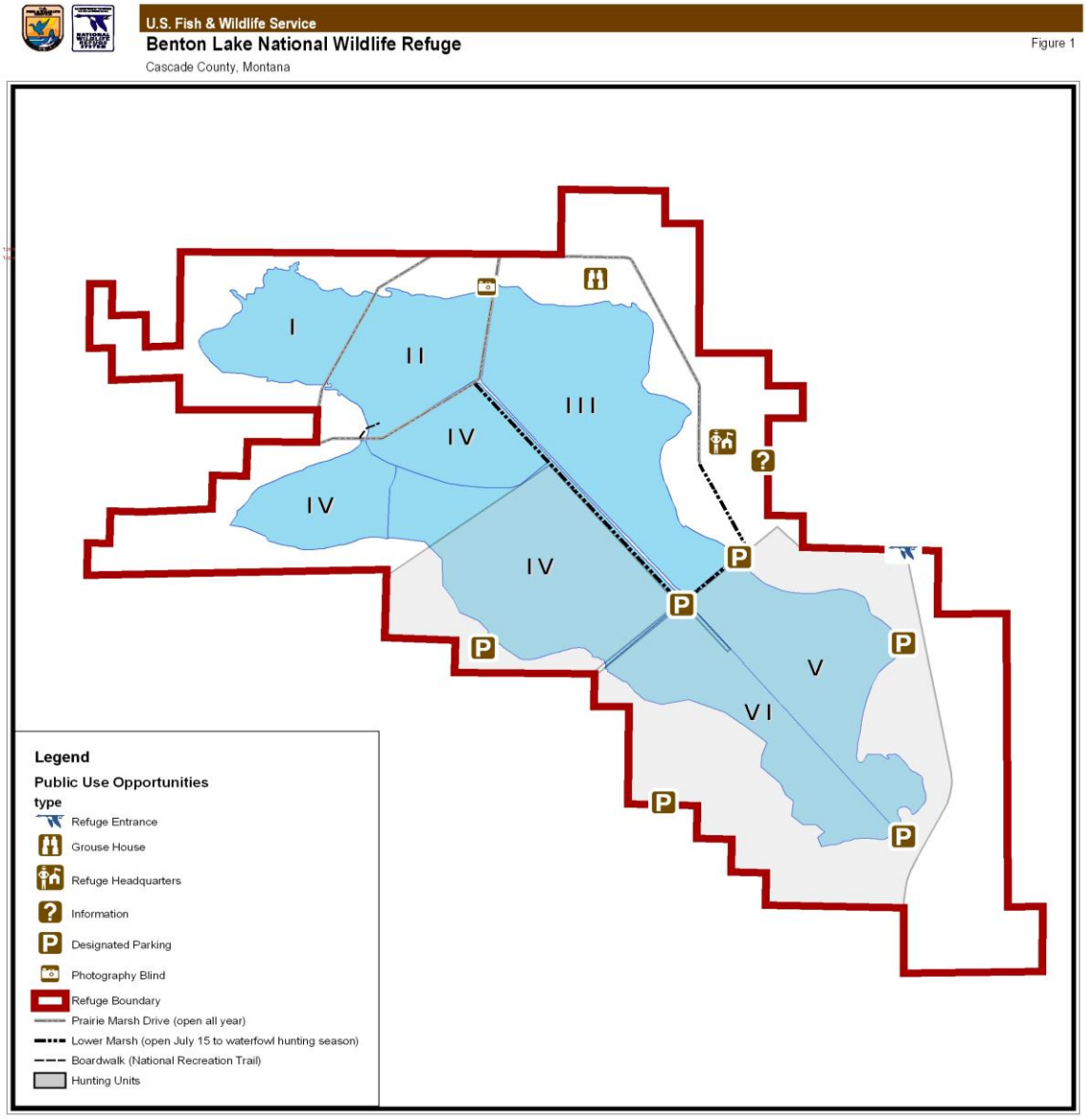
Public Use of Benton Lake

The refuge is open year-round to visitors. There is an auto-tour route that circles Units I and II that provides access for wildlife viewing, photography and interpretation year round. A second auto-tour route circles Unit III and is open July 15 to the start of waterfowl season. There is a short boardwalk on Unit II that provides additional wildlife viewing opportunities. School groups also visit the refuge for environmental education programs, primarily in the spring. The refuge is open to hunting from the start of waterfowl season in the fall until November 30th. Annual visitation on the refuge is estimated at 10,000.

History of Wildlife Disease

Botulism has been the disease of primary concern historically at Benton Lake NWR. From 1989-1991 there were botulism outbreaks each year resulting in several hundred dead birds. Since 1991, the mortality from botulism outbreaks has dropped

considerably. The reason for this change is not clear. There have been isolated incidences of chlamydiosis and avian cholera. The refuge is currently involved in surveillance for west nile virus, chronic wasting disease and avian influenza. Chronic wasting disease and high-pathogenicity avian influenza have not been found on the refuge. West nile virus has been detected in mosquitoes on the refuge, but the overall risk was considered low and no associated bird mortalities were detected.



Overview of Disease Response at Benton Lake NWR

This disease contingency plan for Benton Lake Complex outlines, in detail, the appropriate response guidelines for a wildlife mortality or morbidity event. In the subsequent sections, each disease that has historically occurred on the refuge, or is a probable threat, is discussed in detail. Each section starts with background on the disease and its history on Benton Lake Complex. The remaining sections outline the appropriate response. Although there are details specific to each disease, the initial steps are similar in all cases. This is especially true of the avian diseases. (Chronic wasting disease is a unique case and is treated separately in the last section). Figure 2 shows a flow-chart outlining the general response to dead or sick birds observed on the Complex. This flowchart is customized in each disease section to clarify the response.

Although this plan focuses on Benton Lake Refuge, the response and resources would also apply to a disease outbreak on a Waterfowl Production Area (WPA) in the Wetland Management District. Most of the resources for addressing an outbreak are based at the refuge, with the exception of the Blackfoot Valley WPAs. In the Blackfoot Valley a station manager is present on the H2-0 WPA and has access to vehicles and boats for carcass pickup. Any specimens associated with a mortality or morbidity event in the Blackfoot Valley will be sent to the refuge for submission to the National Wildlife Health Center.

In general, the Complex's response should follow these initial steps
(line #s correspond to reference numbers in Figure 2)

(1) if sick or dead wildlife are observed, a disease response is initiated. Currently, a disease surveillance route is conducted on the refuge 1-2 times per week, year round.
(2) Referring to the introductory section of each disease section in this document will provide some clues to likely causes. For example, the species involved, the location on the refuge, time of year, etc. Conducting a field investigation and recording an event history form is very important. (See appendix A for the specimen history data sheet).
(3) Consult with the appropriate wildlife health professional regarding advice on interim response and sending in specimens for diagnosis. In most cases this will be the USGS National Wildlife Health Center. See appendix B for detailed instruction on collection and shipment of avian carcasses.
(4) In most cases, staff from Benton Lake will likely be sending in specimens for accurate diagnosis.
(5) Depending on the advice of the wildlife health professional, interim carcass disposal and appropriate management actions (if any) should be started. The refuge has several 4WD vehicles, 2 ATVs and 2 airboats for collecting carcasses. Currently, the refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only people certified to operate the airboats. Consult with the wildlife health professional and the appropriate section in this DCP to determine what level of Personal Protective Equipment is

necessary and any required sanitation procedures for equipment. The refuge has an existing botulism pit available for carcass burial when this is the appropriate response.

(6)-(7) Send in specimens for diagnosis. See appendix B for detailed instruction on collection and shipment of avian carcasses.

(8) Further response will depend on the diagnosis. Refer to the specific section of this DCP that corresponds to the appropriate disease for further detail.

(9) In general, the Project Leader will be the point of contact from the Complex for all communication during the disease response.

Avian Diseases

Avian Cholera

Background and History on Benton Lake Complex

Infection with the bacterium *Pastuerella multocida* is the cause of avian cholera. There are several different subspecies of *P. multocida* that can infect birds and mammals, however, one particular strain, Type 1, is the primary agent in avian cholera in wild birds. Major outbreaks typically affect waterbirds, particularly waterfowl and coots (Friend 1999).

Avian cholera can be spread among birds through a variety of methods. Ingestion by birds of food and/or water where *P. multocida* is present is one of the most important pathways. The bacteria can also be spread via direct bird contact with other infected birds, their secretions or feces. Aerosol transmission is another possibility. *P. multocida* can persist in the environment for up to 4 months, in soil and on the surface of wetlands, and in carcasses for up to 3 months (Friend 1999).

As of 2004, only occasional outbreaks of avian cholera resulting in deaths of relatively few birds have been reported in Montana (USGS,http://www.nwhc.usgs.gov/disease_information/avian_cholera/index.jsp). In April 1992, two snow geese with probable avian cholera were collected on Benton Lake refuge. Nearby, Freezeout Lake Wildlife Management Area also suspected cholera in a small die-off of several snow geese. Cholera outbreaks are often seasonal. In Montana the critical time to be on the lookout for cholera is April through June (Friend 1999).

Disease Surveillance

All year, a regular surveillance route is run twice a week for dead birds and CWD symptomatic deer on the refuge. Cholera affects birds very quickly and consequently few sick birds are usually seen during the early stages of outbreaks. However, sick birds may be lethargic, have convulsions, erratic flight or throw their heads back between their wings and die. Consequently, if a significant die-off of waterbirds occurs, and they appear to be in good condition, avian cholera is a likely candidate (Friend 1999).

Field Investigation of Mortalities or Symptomatic Animals

Risk to humans for contracting avian cholera during field investigations and carcass removal is low because humans are not susceptible to the strain of *P. multocida* that effects waterbirds. But, to add a further level of safety, if birds or other potentially infected animals must be handled, a protective barrier (e.g., gloves, inverted plastic bags) should be used. Hands should be thoroughly washed after specimen collection. Carcass removal and disposal should occur outdoors or in well-ventilated areas. See

appendix B for full details on collecting and submitting specimens.

Submission of whole carcasses is preferable for diagnosis. Alternatively, the heart or liver, sealed in a sterile Whirl-pak, may be submitted. Even if carcasses are in advanced decomposition, wings may be submitted as *P. multocida* can persist in bone marrow for several months. Specimens should be refrigerated and kept cool for submission. If transit time will exceed 24 hrs, freeze the specimens.

Disease Outbreak Response

Management Options

The NWHC recommends carcass removal and incineration, or burial, as standard procedures (see Figure 3 for flow chart of response to avian cholera). A portable incineration unit is currently housed at Medicine Lake NWR and may be brought to Benton Lake if necessary.

Habitat management may help combat avian cholera outbreaks. However, at Benton Lake, water management alternatives are limited during the early spring. Adding water to a unit may sufficiently dilute the concentrations of *P. multocida*, but the refuge does not usually have the option to pump water until mid-May. Similarly, the refuge does not have the management capability to dry out any of the units. However, when pumping does begin in the spring, any unit affected by cholera could be given more or less water, depending on which is deemed more effective.

In addition, the refuge could move birds away from an infected area using the airboat or perhaps with an airplane (in cooperation with Charles M Russell refuge). However, the hazing must be targeted to avoid dispersing infected birds.

Carcass disposal

Dead birds which are not sent in for testing will be collected and buried in the botulism pit or incinerated. The refuge has several 4WD trucks and 2 ATVs that can be used. Alternatively, the refuge has 2 airboats and/or two canoes that can be used to collect birds if they are inaccessible via land. Searching emergent vegetation with an airboat is likely to be important to find as many carcasses as possible. Currently, Steve Assmus, the maintenance worker, and Jim Lange, Wetland District Manager, are the only certified airboat operators on the refuge. Carcasses should be collected in double plastic-lined garbage cans.

Care must also be taken to avoid contaminating new areas while carcasses are transported to the disposal site. Personal protective gear, as well as any part of the airboat or vehicles, that came in contact with the carcasses or wetland should be disposed of or disinfected with a 10% bleach solution or Roccal after carcass collection.

Communication and Coordination

The Refuge Project Leader (PL) will serve as the Benton Lake Complex point of contact for all surveillance and management operations. As such, the Complex PL will be responsible for organizing Refuge on-site resources, coordinating with cooperating agencies and entities, executing the agreed upon responses and notifying appropriate personnel within and outside the Service. The Complex PL will also be responsible for media contacts and dispensing information about control efforts on the Refuge. However, questions concerning policy, finances, and personnel issues that cannot be adequately answered at the field level will be referred to the Regional External Affairs Office (EAO).

Appendix C lists primary contacts with MTFWP, Non-Governmental Organizations, other Federal agencies and adjacent private landowners. Additions to this list will be made as necessary to keep neighbors, groups or agencies informed about the status of cholera on the Refuge.

Equipment and Supplies

Necropsy kits with gloves, tyvek suits, rubber boots, face masks, trash bags, and labels are available in the biological lab in the shop. Three coolers for shipping specimens are stored in the south bay of the shop near the chest freezer. Blue ice packs are kept in the chest freezer. Large rubber trash cans are also located in the shop.

The refuge has several 4WD pickups, 2 ATVs and an airboat for collecting carcasses. The refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits. Alternatively, a mobile incinerator may be borrowed from Medicine Lake NWR.

Food and Lodging

If the bunkhouse is available, up to 6 additional people may be able to stay on refuge. Otherwise a list of hotels in Great Falls is in Appendix D.

Data Recording

Data sheets for routine, twice-weekly surveillance routes are kept in the Biologist's office in the filing cabinet under Biotic/Birds/Disease/.

Any completed field investigation sheets (appendix A) and subsequent reports from the NWHC will also be filed in the Biologist's office under Biotic/Birds/Disease/Avian Cholera.

Avian influenza

Avian influenza (AI) is a disease caused by a virus that infects domestic poultry and wild birds (primarily geese, ducks and shorebirds). Each year, there is a bird flu season just as there is for humans and, as with people, some forms of the flu are worse than others.

AI strains are divided into two groups based on the pathogenicity of the virus—the ability of the virus to produce disease.

Low Pathogenicity Avian Influenza (LPAI): Most AI strains are classified as low pathogenicity and cause few clinical signs in infected birds. LPAI generally does not pose a significant health threat to humans. However, LPAI is monitored because two strains of LPAI—the H5 and H7 strains–can mutate into highly pathogenic forms.

High Pathogenicity Avian Influenza (HPAI): This type of avian influenza is frequently fatal to birds and easily transmissible between susceptible species. The strain that is currently of concern in Asia, Europe, the Middle East and Africa is the H5N1 HPAI virus.

Most avian influenza viruses have been isolated from wild waterfowl (ducks, geese, and swans) shorebirds (wading birds), gulls, and terns. With rare exception, the thousands of flu isolates found in wild birds have been low pathogenic avian influenza and have rarely caused signs of illness.

Currently, the highly pathogenic strain of H5N1 avian influenza is *not* present in the United States. There are a number of ways that highly pathogenic H5N1 could potentially reach the United States—wild bird migration, illegal smuggling of birds or poultry, travel by infected people or people traveling with virus-contaminated articles from regions where H5N1 already exists.

Pacific Flyway is thought to be a likely route for H5N1 if it enters North America. Benton Lake NWR lies at the edge of the Pacific and Central flyways in Montana. There are no nearby, commercial poultry operations.

Disease Surveillance

In the fall of 2006, Benton Lake staff cooperated with surveillance activities for AI led by Montana Fish, Wildlife and Parks and US Department of Agriculture (APHIS) (MTFWP 2006b). During banding season, 465 live birds (primarily mallards and northern pintails) were sampled for AI. There was one positive result for low-pathogenicity H5N1, but no positive results for the high-path form. During hunting season, 74 hunter killed birds were sampled and there have been no positive results.

Field Investigation of Mortalities or Symptomatic Animals

The specific type of personal protection equipment (PPE) used in investigating migratory disease outbreaks will follow that outlined above for HPAI surveillance which are based on the site-specific HPAI risk assessment. Higher levels of risk will require different PPE.

MANAGEMENT ACCEPTANCE OF RISK

Risk Criteria	Risk Level		Approval Authority
HPAI not suspected or unlikely	1	Low Risk	Project Leader
HPAI suspected in sick or dead birds	2	Medium Risk	Assistant Regional Director
HPAI confirmed in birds	3	High Risk	Deputy Regional Director
HPAI confirmed in humans	4	Extremely High Risk	Deputy Regional Director

As indicated in the above table, the Service HPAI Response Plan requires an assessment of the level of risk at each station, at a minimum identified in writing by the project leader. Higher levels of risk will require the project leader to make that determination followed by concurrence at a higher level. Project leaders have the responsibility to discuss with field personnel the current site-specific HPAI risk assessment and ensure employees are trained in use of appropriate PPE.

Under Risk Level 1, for routine or surveillance work, personal protection procedures and supplies consist of:

1. Work in a well-ventilated area if indoors.
2. To the extent possible, handle birds downwind of personnel to decrease the risk of inhaling aerosols such as dust, feathers, or dander.
3. Wear gloves.
4. Consider wearing eye protection.
5. Consider wearing respiratory protection.
6. Do not eat, drink, or smoke while handling birds.
7. Wash hands or use hand sanitizer before eating, drinking, or smoking.
8. Have appropriate PPE Kit available.
9. Notify Project Leader/Supervisor if sick or dead birds are detected or found.
10. If instructed to collect sick or dead birds, follow “collection protocol”.

Under Risk Level 2, PPE use consists of:

1. Follow Level 1 guidelines and measures.

2. Elevate to Level 2 protection, i.e. must wear coveralls, rubber boots, and nitrile, latex, or rubber gloves.
3. Minimize exposure to mucosal membranes by wearing protective eyewear and mask.
4. Decontaminate and properly dispose of potentially infectious material, including carcasses. (see carcass disposal)

Risk Levels 3 and 4 (HPAI confirmed in birds and humans) require a series of steps be taken at the Refuge and Regional levels. These details will be provided at a later time with the Service's HPAI National Response Plan.

Whole specimens may be submitted according to the protocol in Appendix A. If HPAI specific samples are to be collected, see Appendix E for the specific protocol for packing and shipping HPAI samples. A list of HPAI-certified laboratories can also be found in appendix E.

Disease Outbreak Response

Management Options

How we respond will be determined by the facts of the particular situation (see Figure 4). Should it be necessary, refuge managers have the authority to close all or part of a refuge when public health and safety is at risk. The Fish and Wildlife Service and State fish and wildlife agencies have the legal authority to close the migratory bird hunting season to protect public health in their jurisdictions. With HPAI, hazing and dispersal are highly unlikely to be appropriate management responses. There are no nearby poultry operations and domestic birds are not normally found on the refuge. As with any disease affecting wild birds, the Service and State Fish and Wildlife Agencies will closely monitor the situation with other partners such as the USGS National Wildlife Health Center, the agricultural health community and the public health community.

The Service HPAI Response Plan requires the Regional Director to develop a regional Crisis Management Team that specifically focuses on the human element and risk to Service employees. The primary responsibilities of this team are to define roles and responsibilities for preparedness and response planning, identify essential services and personnel in the event of a pandemic, and review protocols and current CDC and epidemiology guidance.

Carcass disposal

Dead birds which are not sent in for testing will be collected and buried in the botulism pit or incinierated. The refuge has several 4WD trucks and 2 ATVs that can be used. Alternatively, the refuge has 2 airboats and/or two canoes that can be used to collect birds if they are inaccessible via land. Searching emergent vegetation with an airboat is likely to be important to find as many carcasses as possible. Currently, the refuge

maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat. Carcasses should be collected in double plastic-lined garbage cans.

Care must also be taken to avoid contaminating new areas while carcasses are transported to the disposal site. Personal protective gear, as well as any part of the airboats or vehicles, that came in contact with the carcasses or wetland should be disposed of or disinfected with a 10% bleach solution or Roccal after carcass collection.

Communication and Coordination

In the event of the first H5N1 avian influenza detection in United States' wild birds and poultry, the U.S. Department of Agriculture (USDA) has been designated the lead agency on all communications activities associated with HPAI (see appendix F – R6 Response Organization and Guidelines for Avian Influenza Communications). The Department of the Interior (DOI) will support USDA. Within DOI, U.S. Geological Survey (USGS) has been tasked with leading the Department's response to HPAI. As the lead Federal agency responsible for migratory bird conservation and management, the Fish and Wildlife Service (Service) will be expected to articulate a response to AI as it relates to our trust responsibilities and take the lead in conveying information to our constituents and partners.

- When there is a presumptive H5N1 finding (high or low pathogenicity still unknown), the USDA and DOI will announce the finding. If this happens, the NWHS or USDA will brief the Assistant Secretary for Water and Science (Tom Weimer) on the HPAI confirmation. The ASWS office will brief FWS Science Staff (Gary Frazer)/USFWS Director.

All H5 samples will be sent to the National Veterinary Service Laboratory in Ames, Iowa, to confirm the H5 finding and then test for N1 (1 day). If a sample is positive for the H5N1 virus, it will be further tested to determine if it is high or low pathogenic, which will take another 3-10 days.

- Upon first confirmation, it will be the responsibility of Washington Office (WO) External Affairs to coordinate with USDA and DOI public affairs on the method and timing of the release of this information to the public, as well as to Service regions, Congress, State natural resources agencies and media. WO External Affairs will help the Directorate working group notify and explain the risks to employees. WO External Affairs will coordinate with Regional External Affairs offices to notify the public and employees. WO External Affairs may also prepare an all-employee-memo (to be sent out by the Director) as directed and approved by the Director's office.

If HPAI is detected in wild or domesticated birds in the United States, USDA plans to implement a Joint Incident Command (JIC) Center either in Washington, D.C., or near the outbreak site. The Service expects to be asked to detail personnel to the Center.

Chain of command:

1. FWS Science Advisor (either Gary Frazer or Dan Ashe) will notify the Director's Office.
2. The Director's Office will notify affected Regional Directors (RD).
3. RD will notify affected Refuge Manager/Project Leader and State Natural Resource Agency Directors.
4. Assistant Director of External Affairs will notify affected Regional Office (RO) External Affairs.
5. RO will notify affected Project Leaders and employees in RO and Field Offices.
6. RO External Affairs will notify affected State natural resources agency communications specialists.
7. State natural resources agency will be asked to notify state veterinarian.
8. State natural resources agency will be asked to coordinate communication among state agricultural and health organizations.
9. WO Native American Liaison (Pat Durham) will work with regional counterparts to notify affected tribes.
10. At the same time, WO External Affairs and other Programs are coordinating information at their level.

- **Regional Office Response (if detection is on FWS- Region 6 administered lands)**

    - RD will notify affected Refuge Manager/Project Leader
    - RD will notify Regional Office Assistant Regional Directors and Safety Office Chief, and subsequently all employees, by email, about the situation.
    - ARD – Refuges will notify R6 FWS State AI Coordinators
    - FWS State AI Coordinators will notify their contacts at State Fish and Game agencies
    - External Affairs will notify public affairs contacts at State Fish and Game agencies
    - External Affairs will provide media and congressional outreach support (possibly on-site)
    - Dr. Tom Roffe will be available as technical expert (on-site, depending on situation)
    - Regional Safety Office will notify all employees of the current risk and applicable precautions for working with wild birds

Communications Strategy on-site (if detection is on FWS-managed land):

- Refuge Manager/Project Leader consider restricting public and media access to area (refer to wildlife morbidity/mortality response flowchart)
- Law Enforcement available to enforce any restrictions
- Public Affairs inform media, local community, congressional offices and tribal governments of current situation and provide updates, as warranted

Equipment and Supplies

Benton Lake NWR is a USFWS designated cache site for AI PPE. This cache includes gloves, tyvek coveralls, boot covers, disposable N95 respirators and incineration bags.

The refuge has several 4WD pickups, 2 ATVs and 2 airboats for collecting carcasses. The refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits. In addition, a portable incinerator is available at Medicine Lake NWR.

Food and Lodging

If the bunkhouse is available, up to 6 additional people may be able to stay on refuge. Otherwise, a list of hotels in Great Falls (10 miles away) is in appendix D.

Data Recording

Avian Influenza surveillance activities at Benton Lake NWR in 2006 were reported to the USFWS Montana AI Coordinator, Lee Jones. Copies of the datasheets completed by Montana Fish, Wildlife and Parks for samples that they submitted from Benton Lake NWR are kept in the refuge biologist's files under Biotic/Birds/Disease/Avian Influenza.

The Interagency team is developing standardized data reporting and distribution systems. These will need to be adopted into the Complex's DCP, but are currently not available.

Botulism

Background and History of Botulism on Benton Lake Complex

Avian botulism is caused by the ingestion of a toxin produced by the bacterium, *Clostridium botulinum*. The disease occurs almost annually in Montana and in other western and Great Plains states, resulting in extensive losses of wild birds. The precise factors leading to avian botulism outbreaks are unknown, but the outbreaks are often perpetuated by a well-understood bird-maggot cycle (Jensen and Allen 1960). Toxin production follows bacterial spore germination during multiplication of the vegetative form; this initial toxin production process is poorly understood. Important environmental factors that contribute to the initiation of avian botulism include abrupt changes in water quality parameters such as dissolved oxygen, pH, and ambient temperature (Friend and Cross 1995). Current detection of a botulism outbreak is dependent on the occurrence of dead or sick birds during field surveys coincident with surveys for Chronic Wasting Disease and West Nile Virus. If sick or dead birds are observed, they need to be picked up immediately to prevent the maggot cycle.

Number of Bird Deaths	MONTH				
YEAR	June	July	August	September	Grand Total
1989	22	67	247	108	444
1990		37	160	6	203
1991		36	384	164	584
1992		10	30		40
1995			9		9
1996		7	28	7	42
1997		16	30		46
1998		4	15		19
1999		14	60	41	115
2000		2	11	2	15
2001		3	1		4
Grand Total	22	196	975	328	1521

From 1989-1991 there were botulism outbreaks each year resulting in several hundred dead birds. Since 1991, the mortality from botulism outbreaks has dropped considerably, although the reasons for this are unclear.

Disease Surveillance

All year, a regular surveillance route is run twice a week for dead birds and CWD symptomatic deer on the refuge.

Lines of carcasses coinciding with receding water levels generally typify the appearance of major botulism die-offs (Rocke and Friend 1999). In some impoundments, such as on Benton Lake NWR, where water levels are relatively stable (e.g. Units I and II), affected birds may be found in areas of flooded vegetation. Healthy, sick and recently

dead birds will commonly be found together during an outbreak.

Avian botulism affects the peripheral nerves and results in paralysis of voluntary muscles. Inability to sustain flight is seen early in botulism, followed by paralysis of the legs. As a result, birds often propel themselves across the water and mud flats with their wings. This is unlike lead poisoning, where birds still have use of their legs, but may not be able to fly. Paralysis of the inner eyelid and neck muscles follow, resulting in the inability to hold the neck (Rocke and Friend 1999).

Field Investigation of Mortalities or Symptomatic Animals

Type C botulism, typically found in wild birds, has not been associated with disease in humans. But, to add a further level of safety, if birds or other potentially infected animals must be handled, a protective barrier (e.g., gloves, inverted plastic bags) should be used. See appendix B for full details on collecting and submitting specimens

Disease Outbreak Response

Management Options

Prompt removal and proper disposal of vertebrate carcasses by burial, especially during outbreaks, is highly effective for removing substrates for toxin production (see Figure 5). The importance of prompt and thorough carcass removal cannot be overemphasized (Rocke and Friend 1999). Failure to carry out adequate carcass removal and disposal programs can cause a rapid build-up of highly toxic decaying matter and toxin–laden maggots, thereby accelerating losses in waterbirds as well as seeding the environment with more botulism spores as the carcasses decompose.

Carcass disposal

Dead birds which are not sent in for testing will be collected and buried in the botulism pit or incinerated. The refuge has several 4WD trucks and 2 ATVs that can be used. Alternatively, the refuge has two airboats and/or two canoes that can be used to collect birds if they are inaccessible via land. Searching emergent vegetation with an airboat is likely to be important to find as many carcasses as possible. Currently, the refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat. Carcasses should be collected in double plastic-lined garbage cans.

Care must also be taken to avoid contaminating new areas while carcasses are transported to the disposal site. Personal protective gear, as well as any part of the airboat or vehicles, that came in contact with the carcasses or wetland should be disposed of or disinfected with a 10% bleach solution or Roccal after carcass collection.

Communication and Coordination

The Refuge Project Leader will serve as the Benton Lake Complex point of contact for all surveillance and management operations. As such, the Complex PL will be responsible for organizing Refuge on-site resources, coordinating with cooperating agencies and entities, executing the agreed upon responses and notifying appropriate personnel within and outside the Service. The Complex PL will also be responsible for media contacts and dispensing information about control efforts on the Refuge. However, questions concerning policy, finances, and personnel issues that cannot be adequately answered at the field level will be referred to the Regional External Affairs Office (EAO). Any staff member that observes an injured or symptomatic animal should immediately inform the PL so the animal and/or samples can be collected in a timely manner.

Appendix C lists primary contacts with MTFWP, Non-Governmental Organizations, other Federal agencies and adjacent private landowners. Additions to this list will be made as necessary to keep neighbors, groups or agencies informed about the status of botulism on the Refuge.

Equipment and Supplies

Necropsy kits with gloves, tyvek suits, rubber boots, face masks, trash bags, and labels are available in the biological lab in the shop. Three coolers for shipping specimens are stored in the south bay of the shop near the chest freezer. Blue ice packs are kept in the chest freezer. Large rubber trash cans are also located in the shop.

The refuge has several 4WD pickups, 2 ATVs and 2 airboats for collecting carcasses. The refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits. Alternatively, there is a portable incinerator at Medicine Lake NWR that could be brought to Benton Lake NWR.

Food and Lodging

If the bunkhouse is available, up to 6 additional people may be able to stay on refuge. Otherwise a list of hotels in Great Falls is in Appendix A.

Data Recording

Data sheets for routine, twice-weekly surveillance routes are kept in the Biologist's office in the filing cabinet under Biotic/Birds/Disease/.

Chlamidyosis

Background and History on Benton Lake Complex

Infections in birds are caused by bacteria (primarily *Chlamydia psittaci*) often transmitted by inhalation of the bacteria from feces or nasal discharge from infected birds. Not all birds will exhibit symptoms, but depending on the strain and the susceptibility of the bird, the infection can have severe and deadly effects. Species in northcentral Montana that are likely to be afflicted with chlamydiosis include waterfowl, herons, gulls, terns, shorebirds, songbirds and upland gamebirds. Close contact, especially during times of stress such as migration, breeding or cold weather, may increase the likelihood of a chlamydiosis outbreak. Because of this, colonial nesting birds are especially vulnerable (Franson 1999).

In the late summer of 1999, a mortality event suggestive of chlamydiosis occurred in waterfowl at Benton Lake NWR. Three mallards were emaciated and had airsacculitis suggestive of chlamydiosis. One of these mallards also had a prominent acute pneumonia and infectious chlamydia was isolated from the air sac and lung.

The NWHC collected nonlethal samples from trapped waterfowl and environmental samples to test for the presence of infectious chlamydia. Cloacal and tracheal swabs and sera were collected from 62 waterfowl including mallards, coots, pintails, shovelers, California gulls, scaup, and gadwall. Infectious chlamydia was isolated from 7 of these live waterfowl. Tissues obtained from 1 of 6 waterfowl found dead were positive for chlamydia. In 2000, waterfowl were sampled again for chlamydiosis, but none were positive.

Disease Surveillance

All year, a regular surveillance route is run twice a week for dead birds and CWD symptomatic deer on the refuge. Visible signs of the infection can vary widely, and birds may be carriers that do not exhibit any symptoms. Visible symptoms, which may vary in intensity, include emaciation, birds that are motionless and huddled up with ruffled feathers, and birds with pussy discharges of the eyes and nares. Feces may appear dark green or runny and blood-colored (Franson 1999).

Field Investigation of Mortalities or Symptomatic Animals

The possibility of staff contracting chlamydiosis during field investigations and carcass removal is a serious concern. The bacteria can remain viable for several months. Infection commonly occurs from inhaling the bacteria in airborne particles from feces or nasal discharge. Any bird roosts associated with an outbreak may warrant special

concern as chlamydiosis can persist in dried feces (Franson 1999).

Staff investigating possible chlamydiosis outbreaks should wear a N95 respirator in addition to gloves, boots, coveralls and eye protection. Dry, dusty areas with bird droppings can be wetted down with a 10% solution of bleach or roccal.

Diagnosis is based upon the isolation of Chlmaydia sp. from tissues of infected birds. Whole birds should be submitted. If whole birds are not available, lungs, spleen, liver and/or affected air sacs are preferred tissues. See appendix B for full details on collecting and submitting specimens

Disease Outbreak Response

Management Options

Figure 6 outlines the general disease response. Sick birds should be collected and euthanized. Carcasses should be picked up and buried in the botulism pit. All equipment and non-disposable PPE should be disinfected with 10% bleach solution or Roccal after collection and prior to moving to any other portion of the refuge. A bag-lined rubber trash can should be used to collect carcasses.

The level of human activity in the area of an outbreak should be carefully considered. Human activity may cause redistribution of birds that could result in the spread of the infection to new areas. If the outbreak occurs in an area of the refuge open to the public, the Refuge Manager should consider closing the area until the risk of further outbreak has passed. Staff should collect carcasses and monitor the area while minimizing disturbance.

If an outbreak occurs during refuge banding operations, banding should be suspended while the outbreak is investigated.

Carcass disposal

Dead birds which are not sent in for testing will be collected and buried in the botulism pit or incinerated. The refuge has several 4WD trucks and 2 ATVS that can be used. Alternatively, the refuge has two airboats and/or two canoes that can be used to collect birds if they are inaccessible via land. Searching emergent vegetation with an airboat is likely to be important to find as many carcasses as possible. Currently, the refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat. Carcasses should be collected in double plastic-lined garbage cans.

Care must also be taken to avoid contaminating new areas while carcasses are transported to the disposal site. Personal protective gear, as well as any part of the airboat or vehicles, that came in contact with the carcasses or wetland should be

disposed of or disinfected with a 10% bleach solution or Roccal after carcass collection.

Communication and Coordination

The Refuge Project Leader will serve as the Benton Lake Complex point of contact for all surveillance and management operations. As such, the Complex PL will be responsible for organizing Refuge on-site resources, coordinating with cooperating agencies and entities, executing the agreed upon responses and notifying appropriate personnel within and outside the Service. The Complex PL will also be responsible for media contacts and dispensing information about control efforts on the Refuge. However, questions concerning policy, finances, and personnel issues that cannot be adequately answered at the field level will be referred to the Regional External Affairs Office (EAO). Any staff member that observes an injured or symptomatic animal should immediately inform the PL so the animal and/or samples can be collected in a timely manner.

Appendix C lists primary contacts with MTFWP, Non-Governmental Organizations, other Federal agencies and adjacent private landowners. Additions to this list will be made as necessary to keep neighbors, groups or agencies informed about the status of chlamydiosis on the Refuge.

Equipment and Supplies

Necropsy kits with gloves, tyvek suits, rubber boots, trash bags, and labels are available in the biological lab in the shop. Staff that have been certified to wear a respirator should wear the respirator issued to them (with N95 filters). Three coolers for shipping specimens are stored in the south bay of the shop near the chest freezer. Blue ice packs are kept in the chest freezer. Large rubber trash cans are also located in the shop.

The refuge has several 4WD pickups, 2 ATVs and 2 airboats for collecting carcasses. The refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits. Alternatively, a portable incinerator located at Medicine Lake NWR could be brought to Benton Lake NWR.

Food and Lodging

If the bunkhouse is available, up to 6 additional people may be able to stay on refuge. Otherwise a list of hotels in Great Falls is in Appendix D.

Data Recording

Data sheets for routine, twice-weekly surveillance routes are kept in the Biologist's office in the filing cabinet under Biotic/Birds/Disease/.

Any completed field investigation sheets (appendix A) and subsequent reports from the NWHC will also be filed in the Biologist's office under Biotic/Birds/Disease/Chlamydiosis.

West Nile Virus

Background and History of WNV on Benton Lake Complex

Since West Nile virus (WNV) was first isolated in 1937, it has been known to cause asymptomatic infection and fevers in humans in Africa, West Asia, and the Middle East. Human and animal infections were not documented in the Western Hemisphere until the 1999 outbreak in the New York City metropolitan area. Since then, the disease has spread across the United States.

The 2002 West Nile virus epidemic in the United States was the largest documented outbreak of mosquito-borne meningoencephalitis in the Western Hemisphere. Over 4100 cases of human West Nile meningoencephalitis and West Nile fever were documented, with nearly 300 deaths. Many thousands more were likely infected but suffered mild or no symptoms. In 2003, over 9800 clinical cases were identified in the United States, with 262 deaths. By 2004, the disease had spread from coast to coast in the U.S., with over 2500 documented human cases and 100 deaths. In 2006, WNV activity in Montana was confirmed in 34 human cases. The current status of WNV in the United States can be viewed at http://www.cdc.gov/ncidod/dvbid /westnile/

The virus is transmitted by mosquitoes, and is a disease that cycles primarily within bird populations. Humans and other mammals can become infected with WNV when bitten by an infectious mosquito. Although most human WNV infections are mild, approximately 1 in 150 people may develop meningitis or encephalitis, and of those that develop such serious illness, there is approximately 10-15% mortality. The elderly and persons with compromised immune systems are especially susceptible to developing serious illness from WNV. Horses are also susceptible to WNV infections and exhibit about a 30% mortality rate. An equine vaccine is currently available, but there is no vaccine currently available for humans.

Relatively few mosquito species are efficient at transmitting WNV. Several species in the genus *Culex* are the primary vectors of this disease, but species within other genera may become important vectors when virus activity becomes intense.

West Nile virus was first confirmed in *Culex* mosquitoes at Benton Lake National Wildlife Refuge in 2003. Human and equine cases, including fatalities, were recorded within two miles of the Refuge boundary. Preparation of the Refuge Mosquito Control Strategy was completed in early 2006 (Higgins and Johnson 2006) in order to have a control protocol in place should West Nile once again be confirmed in Refuge mosquito populations.

Disease Surveillance

West Nile virus is unique among other mosquito-borne viruses in the United States in that it causes substantial mortality in birds, particularly species in the family Corvidae

(crows, jays, and magpies). Collection and testing of dead birds has become an important tool in detecting WNV activity. Virus activity is also monitored in adult mosquito populations by capturing mosquitoes in a trap, sorting them to species, and testing same-species pools for virus. Because WNV is primarily a disease of birds, sentinel chicken flocks are sometimes used to provide an initial indication of disease activity by regularly sampling the birds for WNV antibodies. WNV is also detected by testing symptomatic humans and horses.

A monitoring protocol has been established in conjunction with the Cascade County Weed and Mosquito Management District (CCMD). Sampling includes both adult and larval mosquitoes. The CCMD currently uses ABC adult mosquito traps to monitor WNV and mosquito populations on or near the refuge. A West Nile survey route has been established on the Refuge and is run twice weekly from June through October in conjunction with the Chronic Wasting Disease Route to recover and sample any freshly dead avian species to determine if West Nile virus was the cause of death. CCMD staff can sample on site and determine if West Nile virus is present. Threat levels and appropriate chemical treatment responses have been established based on the number of *Culex* mosquitoes that are captured, since this species is the primary vector for West Nile virus.

Field Investigation of Mortalities or Symptomatic Animals

WNV is not contagious from person to person and there is no evidence that a person can get infected by handling live or dead infected birds. But the NWHC recommends that to add a further level of safety, if birds or other potentially infected animals must be handled, a protective barrier (e.g., gloves, inverted plastic bags) should be used. See appendix B for full details on collecting and submitting specimens

Disease Outbreak Response
(This section is excerpted from the Benton Lake NWR Mosquito Management Strategy, Higgins and Johnson 2006) See Figure 7 for flow chart of overall response.

If isolated virus-positive birds are detected within five miles of Refuge, found on the Refuge or Refuge located within published flight range(s) of vector species:

Refuge Response: Refuge staff will continue routine surveys of Refuge lands for dead birds. Dead birds will be shipped to the National Wildlife Health Center, Madison, WI. See Appendix B for handling, shipping and labeling instructions. If a bird tests positive for WNV contact Doug Johnson, Cascade County Mosquito Management Supervisor, 454-6920x303.

Cooperator Response (CCMD): Additional surveillance of the Refuge initiated through trapping of adult and larval mosquitoes for abundance data and virus testing. Virus testing involves use of molecular techniques. Provide summary of field sampling and lab testing reports (species composition, abundance and typical flight ranges) to the Refuge within one week of sampling.

If virus-positive mosquitoes are found on the Refuge, detected within five miles of Refuge or located within published flight range(s) of virus-positive species and larval and adult treatment thresholds have not been exceeded:

Refuge Response: Refuge staff increases frequency of surveys (2-3 times/week) of Refuge lands for dead birds. Provide monitoring results to CCMD, 454-6920.

Cooperator Response: Intensify surveillance of adult *Culex* mosquitoes for abundance data and testing for occurrence of virus by increasing frequency of trapping and testing. Consider increasing sample size of adults collected from Refuge lands and waters. Provide summary of field sampling and lab testing reports to the Refuge within one week of sampling.

If virus-positive Culex mosquitoes are detected within five miles of Refuge, or located within published flight range(s) of virus-positive species and high levels (1-5 larvae per dip) of Culex larvae and adults (≥ 90 female C. tarsalis or C. pipiens per 3 traps/night or ≥ 1,000 Ochlerotatus spp. or Aedes spp) are found in refuge marsh units:

Refuge Response: Continue dead bird surveillance; Consider wetland management actions (such as draw-down) to decrease mosquito populations where *Culex* species exceed threshold levels; Consider targeted larval and/or adult treatment based on the following evaluation supplied by surveillance data: 1) Does evidence indicate an increasing risk for human infection? and 2)Are mosquito species found on the Refuge proven vectors of the disease? and 3) Are the mosquito species found on the Refuge important bridge vectors? and 4) Are the proven vector mosquito species found on the Refuge capable of flying far enough in large enough numbers to infect nearby residents? and 5) Will treatment efforts lower the risk of disease to humans? and 6) Has a threshold level of vector species abundance been exceeded?

Cooperator Response: Continue adult and larval mosquito sampling and testing; Attain approval from Refuge Manager and employ treatment strategy outlined in Appendix B. Re-sample and test treatment locations to determine effectiveness of treatment. Provide summary of treatment locations, type and amount of pesticides used as well as a summary of post-treatment sampling results.

If virus-positive mammal-feeding species of mosquitoes are found on Refuge marsh units or detected within five miles of Refuge or located within published flight range(s) of virus-positive species and treatment thresholds for adult mosquitoes have been met or exceeded:

Refuge Response: Continue dead bird surveillance; Consider wetland management actions (such as draw-down) to decrease mosquito populations where Culex species exceed threshold levels; Consider targeted adult treatment based on the answers to the

following evaluation supplied by surveillance data: 1) Are mosquitoes found on the Refuge known vectors of the disease? 2) Are the mosquito species found on the Refuge important bridge vectors? 3) Are known vector mosquito species found on the Refuge capable of flying far enough in high enough numbers to infect nearby residents? 4) Will treatment efforts lower the risk of disease to humans? and 5) Has a threshold level of vector species abundance been exceeded?

Cooperator Response: Continue adult and larval mosquito monitoring and testing; Recommend specific treatment program and if approved by Refuge Manager, employ treatment. Re-sample and test treatment locations to determine effectiveness of treatment. Provide summary of treatment locations, type and amount of pesticides used as well as a summary of post-treatment sampling results.

If equine cases of WNV are detected within five miles of Refuge or Refuge located within published flight range(s) of virus-positive species, and virus-positive species found within the grassland units of the Refuge and treatment thresholds for adult mosquitoes have been met or exceeded:

Refuge Response: Continue dead bird surveillance; Consider wetland management actions (such as draw-down) to decrease mosquito populations where Culex species exceed threshold levels; Consider specific, targeted adult treatment based on the answers to the following evaluation supplied by surveillance data: 1) Are mosquitoes found on the Refuge known vectors of the disease? and 2) Are the mosquito species found on the Refuge important bridge vectors? and 3) Are the mosquito species found on the Refuge capable of flying far enough in large enough numbers to infect nearby residents? and 4) Will treatment efforts lower the risk of disease to humans? and 5) Has a threshold level of abundance been exceeded? If necessary, contact Refuge Supervisor and develop Pesticide Use Proposal.

Cooperator Response: Continue adult and larval mosquito monitoring and testing; Recommend treatment program and if approved by Refuge Manager, employ treatment. Re-sample and test treatment locations to determine effectiveness of treatment. Provide summary of treatment locations, type and amount of pesticides used and post-treatment sampling results.

If human cases of WNV are detected within five miles of Refuge, located within published flight range(s) of virus-positive species, and virus-positive species found on the Refuge and treatment thresholds for adult mosquitoes have been met or exceeded:

Refuge Response: Continue dead bird surveillance; Consider targeted adult treatment based on the answers to the following evaluation supplied by surveillance data: 1) Are mosquitoes found on the Refuge known vectors of the disease? and 2) Are the mosquitoes found on the Refuge important bridge vectors? and 3) Are the mosquito species found on the Refuge capable of flying far enough and in high enough numbers to infect nearby residents? and 4) Will treatment efforts lower the risk of disease to humans? and 5) Has a threshold level of abundance been exceeded?

Cooperator Response: Continue adult and larval mosquito monitoring and testing; Recommend specific treatment program and if approved by Refuge Manager, employ treatment. Re-sample and test treatment locations to determine effectiveness of treatment. Provide summary of treatment locations, date(s), type and amount of pesticides used and post-treatment sampling results.

Management Options

Control and/or treatment options and efforts are intensified based on the level of risk to humans. More intensive control efforts will be employed as the risk to humans of mosquito-borne disease increases. No mosquito control measures will be allowed on Refuge lands without local and up-to-date mosquito population data.

Risk Category: Moderate

Once Refuge Management approves treatment of adult mosquitoes in defined areas, mosquito abatement will be employed. A one time aerial treatment for adult mosquitoes in defined "buffer zones" to knock down existing adult vectors will be employed. This will be followed by larviciding in approved areas to prevent the continuance of disease vectors.

Adult Treatment Adult mosquito treatments will focus on Refuge grasslands. Anvil (Sumithrin), Aqua-Reslin (Permethrin) or Pyrenone (Permethrin) will be used to aerial spray adult mosquitoes. Spraying will normally be done within the window of opportunity- one hour before dusk to two hours after sunset provided weather conditions are appropriate. CCMD's aerial contractor, utilizing the existing contract between CCMD and aerial contractor, will make adult mosquito aerial applications. CCMD personnel will determine appropriate environmental/weather conditions. Treatments will be done at recommended label rates utilizing the best spraying technologies and equipment available. ABC CO2 baited traps will be utilized in post-treatment sampling to help determine effectiveness of spraying applications. Repeat applications will only be employed if the virus-positive adult populations have not been lowered below threshold levels ($\leq$ 90 *Culex* per 3 traps/night).

Larval Treatment Larval mosquito treatments will focus on disease vector species located on Refuge lands within five miles of major human populations. CCMD personnel utilizing hand or backpack spreaders will do treatments. Vectobac (Bti), Vectolex (Bsi) or Altosid (Methoprene) at recommended label rates will be used for treatments. Treatments will be made when *Culex* mosquitoes are found at the surveillance rates of 1-5 larvae per dip. Post treatment inspections will be made within 72 hours of treatments. Repeat applications will only be employed if larval populations have not been lowered below threshold treatment levels (1-5 *Culex* larvae per dip).

Risk Category: **High**

After approval by Refuge personnel, CCMD will engage in treatment activities. Aerial and ground ULV treatments will target adult mosquito vectors in those areas where they are present at levels exceeding treatment thresholds to prevent the spread of disease. Both ground and aerial larviciding will be necessary to prevent the continuance of the mosquito disease vectors.

Aerial Adult Treatment Adult mosquito treatments will focus on Refuge grasslands. Anvil (Sumithrin), Aqua-Reslin (Permethrin) or Pyrenone (Permethrin) will be used to aerial spray adult mosquitoes. Spraying will normally be done within the window of opportunity- one hour before dusk to two hours after sunset providing weather conditions are appropriate. CCMD's aerial contractor utilizing existing contract between CCMD and aerial contractor will make adult mosquito aerial applications. CCMD personnel will determine appropriate environmental/weather conditions. Treatments will be done at recommended label rates utilizing the best spraying technologies and equipment available. ABC CO2 baited traps will be utilized in post-treatment sampling to help determine effectiveness of spraying applications. Repeat applications will be employed if post-treatment monitoring indicates that adult vector mosquito abundance has not been decreased at or below threshold levels.

Ground Adult Treatment Ground adulticiding will be done by CCMD in those areas where it is feasible to drive a pick-up mounted ULV sprayer within the Refuge grassland units. Anvil (Sumithrin), Aqua-Reslin (Permethrin) or Pyrenone (Permethrin) will be applied at recommended label rates. Spraying will normally be done within the window of opportunity when the mosquitoes are most active- one hour before dusk to two hours after sunset providing weather conditions are appropriate. CCMD personal will determine appropriate environmental/weather conditions. ABC CO2 baited traps will be utilized in post-treatment sampling to help determine effectiveness of spraying applications. Repeat applications will be employed if post-treatment monitoring indicates that adult vector mosquito abundance has not been decreased to or below threshold levels.

Ground Larval Treatment Larval mosquito treatments will focus on disease vector species located on Refuge lands within five miles of major human populations. CCMD personnel utilizing hand or backpack spreaders will do treatments. VectoLex (Bsi), or VectoBac (Bti), and Altosid (Methoprene) formulations will be used at the recommended treatment rates. Treatments will be made when Culex mosquitoes are found at the surveillance rates of 1-5 larva per dip. Post treatment inspections will be made with 72 hours following treatments. Repeat applications will be employed if larval abundance has not been decreased below threshold levels.

Aerial Larval Treatment If large tracts of mosquito larvae are present (more than a total of 80 acres), aerial treatments for mosquito larvae will be utilized. Larval mosquito treatments will focus on virus-positive species located on Refuge lands within five miles of major human populations (>5,000). CCMD's aerial contractor utilizing existing contract between CCMD and aerial contractor will make larval mosquito aerial applications. VectoBac (Bsi) or VectoLex (Bti) at recommended label rates will be used for treatments. Treatments will be made when Culex mosquitoes are found at the surveillance rates of 1-5 larva per dip. Post treatment inspections will be made with 72 hours following treatments. Repeat applications will be employed if larval abundance has not been decreased below threshold levels.

Carcass disposal

WNV is not contagious from person to person and there is no evidence that a person can be infected by handling live or dead infected birds. But, to add a further level of safety, the NWHC recommends if birds or other potentially infected animals must be handled, a protective barrier (e.g., gloves, inverted plastic bags) should be used.

Dead birds, particularly corvids, which are not sent in for testing will be collected and buried in the botulism pit or incinerated. The refuge has several 4WD trucks and 2 ATVs that can be used. Alternatively, the refuge has two airboats and/or two canoes that can be used to collect birds if they are inaccessible via land. Currently, The refuge maintenance worker, Steve Assmus, and Jim Lange, Wetland District Manager, are the only refuge employees authorized to operate the airboat.

Communication and Coordination

For purposes of treatment of Refuge lands for disease carrying mosquitoes, and assessment of risk to human health, the Refuge Manager of Benton Lake National Wildlife Refuge will consult with the Cascade County Weed Management District (CCMD) and Mike Higgins, Mosquito Management Coordinator, U.S. Fish and Wildlife Service, Washington Office, Phone (410) 573-4520 and other biologists and entomologists. The Refuge Manager will contact Refuge Supervisor, Dean Rundle, Phone: (303) 236-4306 of his assessment of the risk of human infection and of his determination regarding treatment within 24 hours. The Regional Supervisor in consultation with the Refuge Chief, Rick Coleman Phone: (303) 236-4303 after reviewing the documentation and after further consultation with public health experts, may concur with or overturn the Refuge Manager's decision regarding treatment. A final decision regarding treatment must be made within 48 hours of receiving documentation of mosquito-borne disease activity.

Equipment and Supplies

Necropsy kits with gloves, tyvek suits, rubber boots, face masks, trash bags, and labels are available in the biological lab in the shop. Three coolers for shipping specimens are

stored in the south bay of the shop near the chest freezer. Blue ice packs are kept in the chest freezer. Large rubber trash cans are also located in the shop.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits. A portable incinerator could be brought from Medicine Lake NWR if needed.

Food and Lodging

If the bunkhouse is available, up to 6 people may be able to stay on refuge. Otherwise, a list of hotels in Great Falls is in Appendix D.

Data Recording

Data sheets for routine, twice-weekly surveillance routes are kept in the Biologist's office in the filing cabinet under Biotic/Birds/Disease/West Nile Virus.

Any completed field investigation sheets (appendix A) and subsequent reports from the NWHC also will be filed in the Biologist's office under Biotic/Birds/Disease/West Nile Virus.

Mammalian Diseases

Chronic Wasting Disease

Background and History of CWD on Benton Lake Complex

Chronic Wasting Disease (CWD) is a transmissible, spongiform encephalopathy of North American deer and elk that is a progressive, fatal, neurological disease. The cause of CWD is unknown, but is associated with malformed prion proteins (National Wildlife Health Center 2006). CWD was initially described in captive deer in Colorado, but later was identified in both wild and captive deer and elk. The disease is currently confirmed in free-ranging cervids in 8 states and 1 province. In Montana, CWD has only been found in one captive elk herd near Philipsburg (Montana Dept. of Livestock 2004). In 2003, over 2,000 samples were collected in Montana from free-ranging elk and deer, all of which tested negative (N. Anderson, pers. comm.). Even so, it has been found in free-ranging cervids in adjacent states, including South Dakota and Wyoming and the Canadian Province of Saskatchewan (National Wildlife Health Center 2004) within 60 miles of the Montana border.

While CWD affects species generally managed by state wildlife departments, the US Fish and Wildlife Service (Service) has management responsibilities for wildlife on Service lands. In addition, the ecological relationships of species on refuges and hatcheries mean that CWD in cervids may impact natural resources directly under Service jurisdiction (e.g. endangered species such as wolves and grizzly bear). The Service recognizes the states have lead responsibility for CWD. Resolving CWD issues involving Service lands will require close coordination with state wildlife agencies. Given this, it is important that the Service and Benton Lake NWR (Refuge) prepare for the potential that this disease will reach Refuge lands.

The total deer population (mule and white-tailed deer) on the Refuge, which is closed to big game hunting, is less than 100 animals. An occasional elk is seen on the refuge. The Benton Lake complex has a relatively low to moderate risk of significant CWD impact based on:

1) Relatively low numbers of deer on the Refuge and no elk.
2) The closest game farm is 25 miles from the Refuge
3) The Powell county WPA's that have the highest deer and elk population are located 50 miles from the nearest game farm.
4) No elk/deer have been relocated on the Refuge, WPA's or adjacent areas within the past 5 years
5) The elk/deer do mix with other cervids off refuge lands.
6) Elk/deer movements are estimated to be > 10 miles
7) There is no record of elk/deer disease or mortality events.

Disease Surveillance

A Chronic Wasting Disease (CWD) Surveillance and Response Plan was completed for Benton Lake National Wildlife Refuge (NWR) in 2004 (USFWS 2004). This plan established a protocol for regular, biweekly surveillance on the refuge. During FY2006, this protocol was modified to reduce surveillance by 1/7 so that some weeks the route is not run twice per week (FY06 Funding Allocation Memorandum). CWD surveillance was conducted during 2005 and 2006 to look for dead deer and symptomatic live deer. Nearly 1,000 observations of cervids, all apparently healthy, have been recorded thus far.

Additionally, refuge staff monitor the Blackfoot Valley Wildlife Management Area and several Waterfowl Production Areas (WPA) during management visits for dead or symptomatic cervids. This effort will be closely coordinated with Montana Fish, Wildlife, and Parks (MTFWP). The large size of the Wetland Management District (WMD) precludes the establishment of a route that can be run on a weekly or biweekly basis.

Field Investigation of Mortalities or Symptomatic Animals

Benton Lake's CWD Plan also outlined our protocol for sampling dead or symptomatic animals (USFWS 2004). Road-killed animals found near the Refuge and any WPAs will be collected (condition permitting) and submitted for testing to Colorado State University (CSU) or the Montana State Lab in Bozeman. We have submitted three specimens to date, two road-killed white-tailed deer and one hunter-killed elk. All specimens were negative.

If live deer or elk are observed exhibiting clinical signs consistent with CWD (emaciation, drooling, staggering, indifferent to surroundings) it may be collected. If an injured or suspect animal is to be collected, the appropriate MTFWP warden will be contacted to inform them of the situation and actions of the Refuge. Cory Loecker, MTFWP Biologist will also be contacted before any collection of symptomatic animals.

The safety of non-suspect cervids will have to be considered because inadvertent harm could occur. The suspect animal should be shot, preferably in the caudal neck, as soon as safe, to ensure minimal likelihood of wounding or affecting other animals.

Persons collecting or handling cervids should wear protective clothing to reduce the risk of contamination and transport of pathogens. Collectors should wear coveralls, washable boots and gloves. Disposable refuse (e.g. tyvek coveralls, gloves, boot covers, etc) will be bagged on site and disposed of in the local municipal solid waste landfill. Boots and non-disposable tools will be washed in 10% chlorox solution or roccal.

Take extra care to avoid or minimize the use of tools and equipment likely to cause injury such as cuts, abrasions and puncture wounds. Where use of such equipment is

unavoidable, wear suitable Personal Protective Equipment (PPE) and clothing. Use face and respiratory protection: a well-fitted respiratory mask and face shield or goggles to protect the eyes and respiratory system from infective droplets or tissue particles. Also, wear disposable gloves while handling tissue samples.

Using appropriate safety and disinfection protocols above, refuge staff will remove heads from cervids collected for CWD surveillance by cutting soft tissues with a knife, then sawing through the vertebral column four inches below the base of the skull. Heads should be double bagged and properly labeled. Heads collected from Refuge sites will include the identification: BNLNWR - date collected - sample number in sequential order (e.g., BNLNWR - 11/12/04-01). Samples collected from specific WPA's will be identified with a numbering system unique to that WPA.

Information to be recorded for animals collected will include: date of collection, personnel involved, general location of collection, type of collection (road kill, taken by CWD personnel during cull operations, targeted as symptomatic, etc.), species, gender, estimated age, list of samples collected, distribution of samples and the final results of the tests.

Heads or samples collected from elk and deer will be stored in the Refuge freezer until transported or processed. Once samples are collected, the CSU wildlife lab should be contacted to schedule a transfer date.

Medical emergency services are available in the event someone is injured while capturing a deer/elk. Depending on the severity of the injury, the Benefis Life Flight ambulance or ground ambulance can be contacted.

Disease Outbreak Response

Management Options

The disease outbreak response would be led by Montana Department of Fish, Wildlife and Parks according to their CWD plan (MTFWP 2006; http://fwp.mt.gov/publicnotices/notice_892.aspx). The refuge response is generalized in Figure 8.

Actions related to the *control and/or management* of CWD will be initiated following the diagnosis of CWD in free ranging Montana deer or elk. Those actions will be focused around the location of the first CWD diagnosis in a deer or elk. The CWD Management program will be adaptive in that changes to the program will be instituted as levels of success achieved both in Montana's CWD management program and with programs ongoing in other states are evaluated and the most effective approaches to CWD prevention, reduction, or elimination are identified. A "CWD Task Force" consisting of interagency membership will facilitate modifications to the plan through periodic plan review.

The final decision on specific management of CWD at the diagnosed epicenter will be made by an "epidemiologic team" (epi-team) and based on the variables that the situation presents. Management will start with radio collaring of 50 animals and a determination of the "home range" of that set of animals through monitoring by radio-telemetry for 6-9 months. During that initial time period, the epi-team will use all "on the ground" information available to select a management action that best fits the situation. The epi-team will also develop any mitigation measures at that time necessary to reduce effects of the management plan on the environment. Alternative actions will be aggressive in their sampling and eradication efforts, either control at <1% strategy or statistical elimination.

Carcass disposal

Although all the facts of transmission are not known, recent data confirm that contaminated environments and infected carcasses serve as sources of transmission. CWD positive animals will be buried on the Refuge at a site chosen by the manager. The Montana USFWS Ecological Service office will have to be contacted to guarantee all regulations are met concerning the effects of animal disposal. All carcasses will be buried on the Refuge and will have to be in compliance with all water quality regulations.

Communication and Coordination

The Refuge Project Leader will serve as the Benton Lake Complex point of contact for all surveillance and management operations. As such, the Complex PL will be responsible for organizing Refuge on-site resources, coordinating with cooperating agencies and entities, executing the agreed upon CWD responses and notifying appropriate personnel within and outside the Service. The Complex PL will also be responsible for media contacts and dispensing information about CWD control efforts on the Refuge. However, questions concerning policy, finances, and personnel issues that cannot be adequately answered at the field level will be referred to the Regional External Affairs Office (EAO). Because our plan relies on passive surveillance, observations of cervids by staff members is a critical factor in our surveillance success. Any staff member that observes an injured or symptomatic animal should immediately inform the PL so the animal and/or samples can be collected in a timely manner.

The Project Leader will be responsible for organizing and coordinating all CWD management operations on-site. If CWD is detected the Project Leader will immediately contact Neil Anderson, MTFWP, to coordinate any response. The Project Leader will also immediately contact the Service External Affairs office to aid in communicating with the public and preparing press releases if necessary. Finally, the Project Leader will contact all adjacent public and private land owners (Appendix C).

Equipment and Supplies

The refuge would hand direction of follow up activities over to the state.

The Refuge will provide any available on-site resources for collection and disposal of animals as outlined above. There is an existing pit dug on the refuge for disposal of carcasses. If this is not the preferred burial site, the refuge has a back-hoe for digging additional burial pits.

The refuge has created 7 CWD sampling kits, complete with all PPE and sampling tools for collecting heads. These kits would be available to Service or State personnel collecting specimens. The refuge has three coolers for transporting specimens. Two coolers could fit 2 heads each.

Refuge staff will coordinate with Montana Fish, Wildlife and Parks biologists and wardens for management of cervid populations throughout the ten county wetland management district. Sample processing will be done according to the MTFWP EA.

Food and Lodging

If the bunkhouse is available, up to 6 members of the epi-team may be able to stay on refuge. Otherwise, a list of hotels in Great Falls is in Appendix D.

Data Recording

Data sheets for routine, twice-weekly surveillance routes are kept in the Biologist's office in the filing cabinet under Biotic/Mammals/Disease/CWD.
This file also contains data summaries of any specimens submitted for analysis as well as yearly summary reports.

Other potential diseases

There are a multitude of other potential diseases not addressed in this plan that at some point in the future may be of concern at Benton Lake Complex. If a mortality event occurs that appears to be different from the diseases described in this plan, the general response depicted in figure 2 should be followed. A complete history and details of the event combined with a diagnosis from the NWHC should enable a swift and appropriate response. The Complex Project Leader will be the primary point of contact for communication and coordination of the disease response.

Disease planning and response will continue to evolve over time. This plan should be reviewed every 1-2 years to update any details or to include new chapters on emerging diseases.

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Appendix A
Field Investigation Data Sheet

Submitter's name: _____ Affiliation: Benton Lake Complex

Address: 922 Bootlegger Trail Great Falls, Montana 59404

Telephone: 406-727-7400

Email:

Date Collected: _____

Method of Collection (dead, euthanized, etc) _____

Collector's name: _____

Specific die-off location (attach map if possible):

State: Montana County: Lat/Long:

Environmental Factors: (such as storms, precipitation, temp. changes, or other stressors)

Disease onset (best estimate of start of outbreak): _____

Species affected: _____

Any selective mortality related to age or sex?

Ratio of sick to dead animals: _____

Known number of dead animals: _____

Estimated dead (consider removal by scavengers, etc): _____

Clinical signs (any unusual behavior or physical appearance):

Population at risk (number of animals that could be exposed to disease): _____

Population movement:

Problem area description (land use, habitat types, etc.)

Comments: (attach additional sheets if necessary)

Appendix B
Instructions for Submitting Avian Specimens

VLFIELDS/BNL_BIOLOGICAL_PROGRAM/BIOTIC/BIRDS/DISEASE/SHIPPING_INSTRUCTIONS_0608

INSTRUCTIONS FOR COLLECTION AND SHIPMENT OF
AVIAN AND MAMMALIAN CARCASSES

Please follow these instructions for collecting and shipping carcasses to the National Wildlife Health Center (NWHC) to insure adequate and well preserved specimens.
Please note that these instructions have been modified to meet recent changes in federal regulations for shipment/transport of biological/diagnostic specimens.

****** If multiple carcasses are found at a location, contact the NWHC about the need for a diagnostic work-up, which will include WNV testing among the tests performed. ******

1. More than one disease may be affecting the population simultaneously. Different species may have varying susceptibility to disease agents. Therefore, collect and ship specimens representative of all species and geographic areas affected.

2. If you plan to collect animals, take along a cooler containing ice packs to immediately chill the carcass(es). Collect animals under the assumption that an infectious disease or toxin is involved. Remember to protect yourself as some of these diseases and toxins are hazardous to humans. Always wear rubber gloves when picking up sick or dead animals. If you do not have gloves, insert your hand into a plastic bag. If you are dealing with a significant number of dead animals, or you suspect the presence of a zoonotic disease agent, additional protective equipment including coveralls, eye protection and N05 respiratory protection should be used.

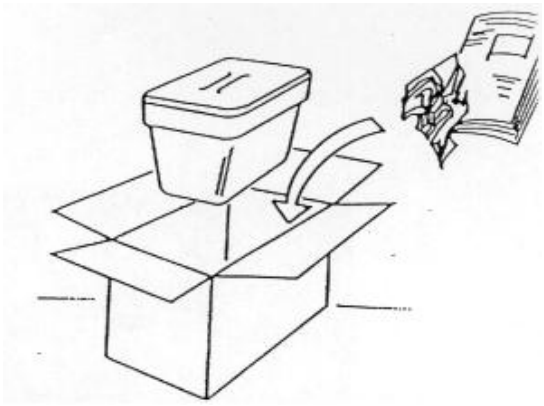
Attach a leg tag to each animal with the following information in pencil/waterproof ink:

- species
- date collected
- location (county/town)
- found dead or euthanized
- collector (name/address/phone)
- any other history that may be pertinent (e.g., the number of other dead or sick animals at the same or nearby location at about the same time)

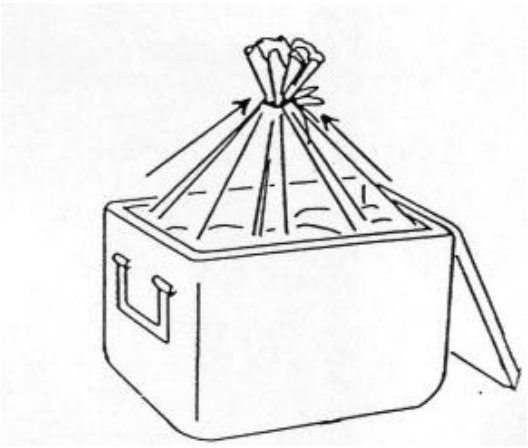
Place each animal in a plastic bag, tie shut, then place inside a second bag and tie shut. This system of double bagging prevents cross-contamination of individual specimens and leaking shipping containers that can contaminate vehicle surfaces and handlers during transportation. Contact the NWHC for assistance with collecting samples from animals that are too large to ship.

If you are shipping more than one carcass/specimen, please be sure

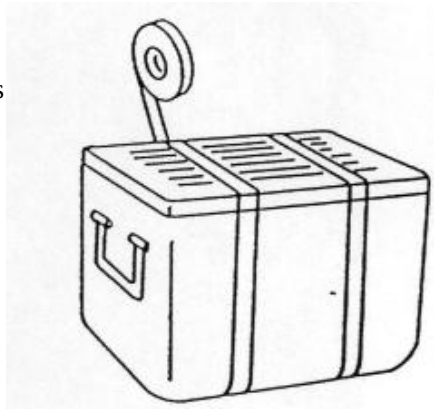
to adequately label each item with local ID number, species, and/or location so that each specimen can be appropriately matched with the accompanying paperwork.



3. Ship animals in a hard-sided plastic cooler. A shipping container can be made by lining a cardboard box with at least 1-inch thick pieces of styrofoam. Hard sided (plastic) coolers will be returned if labeled with your name and address in permanent ink and a pre-paid shipping label is included.



Line the cooler with a large plastic bag and pack the bagged animal(s) in the cooler with enough blue ice to keep carcasses cold. This provides triple packaging to prevent leaks. Blue ice (hardware or department store) is preferred to bagged wet ice to avoid leaking during shipment. If you are shipping blood tubes, culture tubes, or other specimen containers along with the carcasses, these specimens should be placed within a sturdy cardboard or plastic box or screw cap container with padding material. Do not use dry ice unless instructed to do so. Place crumpled newspaper or similar absorbent material in the cooler with the bagged carcasses to fill unused space, keeping ice in contact with carcasses, to provide insulation, and to absorb any liquids. Tape cooler or box shut with strapping tape.



Place a detailed history of the animal and detailed circumstances of the mortality event (appendix A) in a paper envelope or plastic sleeve and tape it to the outside of the cooler. A copy of this history should be faxed or e-mailed to the diagnostic lab at the time of shipment.

4. Prior to shipping contact Emi Saito (esaito@usgs.gov, 608-270-2456). Ship animals by overnight delivery Monday through Thursday to guarantee arrival at NWHC before the weekend. If specimens need to be shipped on Friday please call NWHC to make special arrangements.

The NWHC prefers unfrozen specimens if they can be sent within 24 hours of collection or death. If you cannot ship the carcass(es) within 24-36 hours of pick-up, freeze the animal(s).

5. Label coolers as follows:

   National Wildlife Health Center
   6006 Schroeder Road
   Madison, WI 53711

   ***Please make note of the tracking number in case packages are delayed.

In addition to the NWHC address, please write:

DIAGNOSTIC SPECIMENS - WILDLIFE

in the lower left corner to cover federal shipping regulations and ensure delivery of coolers with specimens to our necropsy entrance

Appendix C
List of contacts in the event of a disease outbreak

Name or Organization	Contact Information
Benefis Mercy Flight	800-972-4000
Ewing, Richard (landowner)	406-463-2305
Suek, Helen (landowner)	406-727-4857
Burgmeier, John (landowner)	406-463-2522
White, Fred (landowner)	406-452-6520
Shane, Marc (landowner)	406-452-9065
Lee, Ron (landowner)	406-463-2596
Great Falls Tribune	406-791-1444
Missoulian	406-523-5200
MTFWP, R4 Director	406-454-5840
MTFWP Lab - Neil Anderson	406-994-6358
MTFWP, Great Falls – Cory Loecker	406-454-5864
USFWS Regional Biologist-Wayne King	303-236-8102
USFWS Regional Chief, Wildlife Health - Tom Roffe	406-994-5789
USFWS MT Ecological Services	406-449-5225
USFWS Ecological Services- NEPA	303-236-7400
USFWS External Affairs	303-236-4508
USGS Wildlife Health website	http://www.nwhc.usgs.gov

Appendix D
List of accommodations for visiting specialists

Recommended Accommodations in Great Falls

Best Western Heritage Inn 1700 Fox Farm Road	406-761-1900
Extended Stay America 800 River Dr S	406-761-7524
Holiday Inn 400 10th Ave S.	406-727-7200
La Quinta Inn & Suites 600 River Dr. S.	406-761-2600

Appendix E
Protocol for the Collection and Shipping of Avian Influenza Samples
And Certified Labs

HPAI Sampling
Protocol for the Collection and Shipping of Tracheal/Cloacal Swab Samples

1. Contact Laboratory to determine specific protocol to use. Laboratories may request samples be placed in tubes containing Viral Transport Medium (VTM) or brain-heart infusion broth (BHI).
2. Thaw appropriate number of pre-labeled tubes of Viral Transport Medium (VTM) or brain-heart infusion broth (BHI) at refrigerator temperature (4 °C) overnight and keep chilled with wet/blue ice packs in a cooler during the day of collection. These will be provided if your Refuge is participating in surveillance.
3. Unwrap a Dacron swab from the stem-end of the packaging.
4. Remove swab and insert the entire head of the swab into the trachea or cloaca. Use gentle pressure and in a circular motion, swab the inside circumference of the trachea/cloaca two or three times.

5. For Cloacal swabs, shake off large pieces of feces.
6. Inserting the swab into the tube containing VTM or BHI broth. With the swab in the media, swirl the stem end of the swab between fingers vigorously. Lift the swab approximately ¼" from the bottom of the vial and bend the stem over the edge of the vial to break off the stem so that the swab remains in the vial and the cap can be screwed tight.
   The entire swab end and a portion of the stem will be left in the tube. If the stems are unable to be broken (some small swabs will have metal stems) then they can be cut with scissors. Scissors should be wiped with 70% alcohol each time they are used to cut a stem.
7. Record sample tube number on banding sheet or a Sample History Sheet along with date, species, age, sex, and location data (GIS coordinates if possible)..
8. Replace tube into cooler for transport back to the base camp. Samples should be kept cold (<4 °C, frozen if possible) and out of direct sunlight.
9. At camp, transfer tubes into liquid nitrogen shippers or into a freezer as soon as possible. Note any exceptions to the collection or storage conditions in field sheets and note such information on the "Sample History and Packing List Form".
10. Place tubes into a hard plastic shipping container with enough frozen gel packs to keep samples cold for at least two days.
11. Notify laboratory that samples are being shipped, the method of shipment (FEDEX is preferred), and the expect date of arrival. Packages should only be shipped on Monday, Tuesday, or Wednesday.

Veterinary Laboratories Currently Certified to Conduct Highly pathogenic H5N1 avian influenza Virus Diagnostics

State	Laboratory Director	Laboratory Name	Telephone	Shipping address 1	Shipping address 2	City	Zip code	Lab Director E-Mail	AI/END Contact
AL		Charles S. Roberts Veterinary Diagnostic Lab	334-844-4987	1001 Wire Road		Auburn	36830		Dr. Fred Hoerr
AR	Dr. Konnie Plumlee	Arkansas Livestock & Poultry Commission Lab	501-907-2400	One Natural Resources Dr.		Little Rock	72205	kpluml@arlpc.org	Dr. Paul Norris
AZ	Dr. Greg Bradley	Arizona Veterinary Diagnostic Laboratory	520-621-2356	2831 N. Freeway		Tucson	85705	gabrad@ag.arizona.edu	Dr. Greg Bradley
CA	Dr. Alex Ardans	California Animal Health & Food Safety Lab	530-752-8709	University of California, School of Vet Med	W. Health Science Drive	Davis	95616	aaardans@ucdavis.edu	Dr. Alex Ardans
CO	Dr. Barbra Powers	Colorado State University Veterinary Diag. Lab	970-297-1281	College of Vet. Med. & Biomedical Sciences	300 West Drake	Fort Collins	80523	bep@lamar.colostate.edu	Dr. Barbara Powers
CT	Dr. Herbert Van Kruiningen	Department of Pathobiology & Veterinary Science	860-486-0837	University of Connecticut, Unit 3089	61 N. Eagleville Rd.	Storrs	06269-3089	herbert.vandruiningen@uconn.edu	Dr. Sandra Bushmich
DE		University of Delaware Poultry Laboratory	302-856-1997	16684 County Seat Hi-Way		Georgetown	19947		Dr. Mariano Salem
FL	Dr. Betty Miguel	Kissimmee Diagnostic Laboratory	407-846-5200	Florida Department of Agriculture	2700 N. John Young Parkway	Kissimmee	34745	miguelb@doacs.state.fl.us	Dr. Betty Miguel
GA		Georgia Poultry Laboratory	770-535-5996	4457 Oakwood Road		Oakwood	30566		Dr. James Scroggs
GA	Dr. Doris Miller	Athens Veterinary Diagnostic Laboratory	706-542-5568	University of Georgia College of Vet Med	Building 1079	Athens	30602	miller@vet.uga	Dr. Doris Miller
GA	Dr. Charles A. Baldwin	University of Georgia	229-386-3340	43 Brighton Road		Tifton	31793-3000	cbaldwin@uga.edu	Dr. Charles

State	Laboratory Director	Laboratory Name	Telephone	Shipping address 1	Shipping address 2	City	Zip code	Lab Director E-Mail	AI/END Contact
		Veterinary Diag. Laboratory							A. Baldwin
HI	Dr. David T. Horio	State Laboratories Division	808-453-5990	2725 Waimano Home Road		Pearl City	96782	david.horio@doh.hawaii.gov	Dr. David T. Horio
IA	Dr. Bruce Janke	Iowa State University	515-294-1950	Veterinary Diagnostic Laboratory	1600 S. 16th St.	Ames	50011	bhjanke@iastate.edu	Dr. Kyoung-Jin Yoon
IN	Dr. Leon Thacker	Purdue University Animal Disease Diagnostic Lab	765-494-7460	406 South Lafayette		West Lafayette	47907	thackerl@purdue.edu	Dr. Leon Thacker
LA	Dr. H.W. Taylor	Louisiana State University	225-578-9777	Veterinary Med Diag. Laboratory	1909 Skip Bertman Drive	Baton Rouge	70803	hwt@vetmed.lsu.edu	Dr. Alma Roy
MD	Dr. Daniel Bautista	Maryland Dept. of Ag & Animal Health Laboratory	410-543-6610	27722 Nanticoke Road		Salsbury	21801		Dr. Daniel Bautista
MI	Dr. Willie Reed	Diagnostic Center of Population and Animal Health	517-353-0635	Michigan State University	4125 Beaumont Rd, Ste 201H	Lansing	48910	reed@dcpah.msu.edu	Dr. Willie Reed
MN	Dr. James E. Collins	Minnesota Veterinary Diagnostic Laboratory	612-625-8787	University of Minnesota, Vet Diag Lab	1333 Gortner Ave, 244 Vet D L	St. Paul	55108	colli002@unm.edu	Dr. James E. Collins
MO	Dr. Alex Bermudez	University of Missouri	573-882-6811	Veterinary Medical Diagnostic Laboratory	1600 East Rollins	Columbia	65211	bermudeza@missouri.edu	Dr. Stanley Casteel
MS	Dr. Lanny Pace	Mississippi Vet Research & Diagnostic Laboratory	601-354-6089	2531 North West Street		Jackson	39216	pace@cvm.msstate.edu	Dr. Lanny Pace
NC	Dr. Gene Erickson	North Carolina Department of Agriculture	919-733-3986	Rollins Animal Disease Diagnostic Lab	2101 Blue Ridge Rd.	Raleigh	27607	gene.erickson@ncmail.net	Dr. Gene Erickson
NE	Dr. David Steffen	Veterinary Diagnostic Center	402-472-1434	University of Nebraska	137 VDC UNL	Lincoln	68583-0907	dsteffen1@unl.edu	Dr. David Steffen

State	Laboratory Director	Laboratory Name	Telephone	Shipping address 1	Shipping address 2	City	Zip code	Lab Director E-Mail	AI/END Contact
NJ	Dr. Robert Eisner	New Jersey Dept of Ag, Division of Animal Health	609-984-2293	State Diagnostic Lab, H & A Building	Rm 201 John Fitch Plaza, P.O. Box 330	Trenton	08625	rjeisner1@comcast.net	Dr. Robert Eisner
NM	Dr. Flint Taylor	New Mexico Department of Agriculture	505-841-2576	Veterinary Diagnostic Services	700 Camino de Salud, NE	Albuquerque	87106	ftaylor@nmda.nmsu.edu	Dr. David Mills
NV	Dr. Anette Rink	Nevada Animal Disease Laboratory	775-668-1182	Nevada Department of Agriculture	350 Capitol Hill Ave.	Reno	89502-2923	arink@govmail.state.nv.us	Dr. Anette Rink
NY	Dr. Alfonso Torres	Animal Health Diagnostic Center	607-253-4136	Cornell University, College of Vet. Med.	S3 110 Schurman Hall, Upper Tower Rd.	Ithaca	14853	at97@cornell.edu	Dr. Sung Kim
OH	Dr. Beverly Byrum	Ohio Department of Agriculture	614-728-6220	Animal Disease Diagnostic Laboratory	8995 E. Main Street, Building 6	Reynoldsburg	43068	byrum@mail.agri.state.oh.us	Dr. Beverly Byrum
OK	Dr. Bill J. Johnson	Oklahoma Animal Disease Diagnostic Laboratory	405-744-6623	Oklahoma State Univ., College of Vet. Med.	Farm Road & Ridge Road	Stillwater	74078	billyjj@cvm.okstate.edu	Dr. W. C. Edwards
OR	Dr. Jerry Heidel	Oregon State Veterinary Diagnostic Lab	541-737-3261	Oregon State Univ., College of Vet. Med.	30th & Washington	Corvallis	97331	jerry.heidel@oregonstate.edu	Dr. Jerry Heidel
PA	Dr. Helen Acland	Pennsylvania State Vet Diagnostic Laboratory	717-787-8808	2305 N. Cameron Street		Harrisburg	17110	hacland@state.pa.us	Dr. Deepanker Tewari
PA		University of Pennsylvania	610-925-6210	Lab of Large Animal Pathology & Toxicology	New Bolton Center, 382 West Street Rd	Kennett Square	19348-1692		Dr. Sherrill Davison
SC	Dr. Pamela Parnell	Clemson Veterinary Diagnostic Center	803-788-2260	500 Clemson Road		Columbia	29229	pprnll@clemson.edu	Dr. Pamela Parnell
TX	Dr. Lelve Gayle	Texas Vet Medical Diagnostic Laboratory	979-845-9000	1 Sippel Road	Drawer 3040	College Station	77843	1-gayle@tvmdl.tamu.edu	Dr. Lelve Gayle
UT	Dr. Tom Baldwin	Utah Veterinary Diagnostic Laboratory	435-797-1895	950 E. 1400 North		Logan	84322-5700	tjbald@cc.usu.edu	Dr. Tom Baldwin

State	Laboratory Director	Laboratory Name	Telephone	Shipping address 1	Shipping address 2	City	Zip code	Lab Director E-Mail	AI/END Contact
VA	Dr. David W. Brown	Virginia Dept of Agriculture and Animal Health Lab	540-434-3897	116 Reservoir		Harrisonburg	22801		Dr. David Brown
WA	Dr. Terry McElwain	Washington Animal Disease Diagnostic Laboratory	509-335-9696	Bustad Hall	Room 155-N	Pullman	99164	tfm@vetmed.wsu.edu	Dr. Terry McElwain
WA		Avian Health and Food Safety Laboratory	253-445-4537	7613 Pioneer Way E.		Puyallup	98371-4919		Dr. A. S. Dhillon
WI	Dr. Leslie Dierauf	USGS National Wildlife Health Center	608-270-2400	6006 Schroeder Road		Madison	53711	ldierauf@usgs.gov	Dr. Leslie Dierauf
WI	Dr. Kathy Kurth and Dr. Pete Vanderloo	Wisconsin Veterinary Diagnostic Laboratory	608-262-5432	Wisconsin Department of Agriculture	6101 Mineral Point Road	Madison	53705	Kathy.Kurth@WVDL.wisc.ed	Dr. Kathy Kurth and Dr. Pete Vanderloo
WV		West Virginia Dept of Agriculture	304-558-2214	1900 Boulevard, East		Charleston	25305-0172		Dr. Jewell Plumley

[a] This list represents the National Animal Health Laboratory Network (NAHLN) labs certified as of 3/14/06 to conduct avian influenza screening. This list will be updated as new labs become certified. For the latest list of certified laboratories, please contact Thomas.J.Deliberto@aphis.usda.gov.

Appendix F
Guidelines for Avian Influenza Communications

Guidelines for Avian Influenza Communications

Policy

The U.S. Fish and Wildlife Service's (Service) areas of expertise on this issue are migratory birds and refuge management. For information about the effects of avian influenza on the poultry industry, visit www.usda.gov/birdflu. For information about the effects of avian influenza on human health, visit www.pandemicflu.gov.

Guidance

Refuge managers and designated staff can provide information on species, habitat, migratory patterns and other general aspects of refuge management. They also can discuss how the refuge is cooperating with state agencies and flyway councils to monitor wild birds.

Please notify Regional External Affairs prior to granting interviews with national news media on avian influenza. Staff will provide advice, assistance and the most current information on this rapidly evolving issue.

Do not speculate with news reporters or the public about hypothetical situations or respond to "what if?" questions about possible scenarios.

Key Messages

- There is not an influenza pandemic in the world at this time.
- The H5N1 avian influenza is primarily a disease of birds.
- HPAI H5N1 has not yet been detected in the United States.
- Avian influenza strains are divided into two groups based on the pathogenicity of the virus—the ability of the virus to produce disease in poultry. Low pathogenic avian influenza is common and most of the time isn't noticeable in birds. High pathogenic strains of avian influenza, such as the HPAI H5N1 circulating in parts of Asia, Europe, and Africa are easily transmitted among birds and are typically fatal to poultry.
- We still don't know for certain what role wild migratory birds play in moving this virus around.
- The wildlife management and agricultural health communities are working together, in consultation with the public health community, to monitor populations of wild migratory birds for highly pathogenic avian influenza.

- Should the HPAI H5N1 virus be detected in the United States, it would not mean the start of a human pandemic, as this virus is still almost exclusively a bird disease at this point.

In the meantime, all news media and public calls regarding human health should be referred to your state's Department of Health, all news media and public calls regarding agricultural health to your state's Department of Agriculture, and all news media and public calls regarding sick or dead wild birds not on U.S. Fish and Wildlife Service lands to your state's Department of Fish and Wildlife.

National media inquiries and questions dealing with national wild bird surveillance planning can be referred to Nicholas Throckmorton, (202) 208-5636. National media inquiries and questions dealing with testing procedures and HPAI pathology can be referred to Paul Slota at the USGS National Wildlife Health Center, (608) 270-2420.

For more information on avian influenza, visit these web sites:

http://www.fws.gov/home/avianflu/
http://www.nwhc.usgs.gov/disease_information/avian_influenza/index.jsp
http://www.fws.gov/migratorybirds/issues/AvianFlu/WBAvianFlu.htm